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A synopsis of Chinese balitorine loaches (Osteichthyes: Homalopteridae) with comments on their phylogeny and description of a new genus

by

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With 2 figures

ABSTRACT

A synopsis of Chinese balitorine loaches (Osteichthyes: Homalopteridae) with comments on their phylogeny and description of a new genus. — A synopsis and keys to *Balitora, Lepturichthys, Hemimyzon, Sinogastromyzon* and *Metahomaloptera* is presented. *Sinohomaloptera* is a junior subjective synonym of *Balitora; B. heteroura* is tentatively considered a synonym of *B. kwangsiensis; B. elongata, B. nujiangensis, B. pengi* and *B. tchangi* are transferred to *Hemimyzon. Jinshaia,* new genus, is proposed for *H. sinensis* (type species) and *H. abbreviata*. Their relationships (investigated on the basis of external morphology) are obscured by parallelisms, reversals and lack of synapomorphies. Numerous problems still to be solved are outlined.

The family Homalopteridae, as traditionally understood, includes small freshwater fishes which inhabit quickly flowing waters in the Oriental area. They have developed many morphological adaptations which allowed them a successful colonization of most mountain streams. Recently (SAWADA 1982), the nemacheiline loaches, formerly placed in Cobitidae, have been placed in the family Homalopteridae. Before this, the family had traditionally been split into the Homalopterinae (characterized by two or more simple pectoral and pelvic rays) and Gastromyzoninae (only one simple pectoral and pelvic ray) (see

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CHEN 1978, 1980a, 1980b, etc.) which have even been given family rank (HORA 1950; SILAS 1954), a point of view not followed by recent authors, or by ourselves.

There are about eight or nine traditionally recognized genera of Homalopterinae (*sensu* HORA 1932), seven of which have been recorded from China (CHEN 1978). A group of genera (including *Balitora, Sinohomaloptera, Lepturichthys, Hemimyzon, Sinogastromyzon* and *Metahomaloptera*) apparently constitutes a monophyletic lineage characterized by its peculiar mouth construction: arched mouth with both jaws covered by a horny sheath; rostral flap divided into three lobes, the median one usually the largest, between rostral barbels; both lips with one or two rows of papillae; lower lip not interrupted; one or two maxillary barbels at the corner of mouth.

Lepturichthys has always been easily diagnosed by its very elongated tail and numerous "barbels" around mouth. *Sinogastromyzon* and *Metahomaloptera* are characterized by posteriorly fused pelvic fins forming a disc. *Metahomaloptera* has minute gill openings restricted to the dorsal surface while in *Sinogastromyzon* the lower extremity of the gill opening is on the ventral surface.

Classically, only two characters have been used to segregate *Balitora, Hemimyzon* and *Sinohomaloptera:* number of barbels at the corner of mouth (one or two) and number of simple pelvic rays (two or more than two) (HORA 1932; SILAS 1954; CHEN 1978). *Balitora* has a single barbel and two simple pelvic rays, *Sinohomaloptera* two barbels and two single pelvic rays, and *Hemimyzon* two barbels and three to six simple pelvic rays. Recently, several new species have been described from Chinese waters which bridge most of the gaps between the different genera. While preparing descriptions of new Indochinese species, the first author met the problem of generic limits within this assemblage. This problem could only be addressed recently with access to specimens of Chinese species. We discovered that the situation was more complex than expected and that the limits of most genera are unclear.

We examined the maxillary barbels, external morphological characters and morphometrics of all but one species of *Balitora,* all *Sinohomaloptera,* all but three *Hemimyzon,* the two *Lepturichthys, Metahomaloptera* and several *Sinogastromyzon* in order to find sets of characters (preferably synapomorphies) for defining lineages (it has not been possible to investigate osteological characters due to lack of time and limited material of most species).

For clarity and convenience, throughout the text, we use the nomenclature introduced in the last chapter (systematic section).

MATERIAL AND METHODS

Examined specimens belong to the following institutions and collections: first author's collection (CMK); Kunming Institute of Zoology (KIZ). The species referred to as *Hemimyzon* sp. is a new species from Thailand, to be described by one of us (KOTTELAT in press).

Methods and measurements follow KOTTELAT (1984) except that head length is the horizontal projection of the distance from tip of snout to a point midway between insertion of first pectoral rays of both fins. Other head lengths proved uninformative, not practical or did not allow precise replicate measurements. Head depth is measured at pectoral fin origin. Pectoral-pelvic distance is from the insertion of last pectoral ray to insertion of first pelvic ray.

The purpose of this study being an attempt to identify lineages within the *Balitora* group and not a study of intraspecific variability, we made measurements on a limited number of specimens (usually one to five); in most cases, very few specimens were available. Specimens used were principally adults and not deformed; ripe females with distended bellies were excluded. Morphological characters have been examined on all specimens.

In the systematic section, only primary synonyms are listed; other references are restricted to recent redescriptions, illustrations or synonymies.

Toponymy follows Pin-yin transcription of Chinese. For those not accustomed to Chinese names of major rivers, those mentioned in the text are: **Jinsha-jiang** is the Upper Yangtze (or Yantse or Yang-Tse-Kiang) which after its confluence with Min-jiang in Yibin (Sichuan Prov.; 28°20'N 104°40'E) is called **Chang-jiang**; **Lancang-jiang** is Mekong River (or Mékong or Mae Khong), **Nu-jiang** is Salween River (or Salawin); **Nanpan-jiang** is an upper branch of **Xi-jiang** (Pearl River); the suffix "-jiang" means stream or river.

RESULTS AND DISCUSSION

TABLE 1

Morphometric data of a representative specimen of 22 species of *Balitora*-like loaches. Data of *B. yaotanensis* are based on Fang's original drawing (1931). Datas are as follow: 1) SL/body width at pelvic origin; 2) SL/head width; 3) head width/head length; 4) SL/head length; 5) SL/distance from anal fin origin to tip of caudal peduncle; 6) SL/length of caudal fin; 7) SL/ length of pectoral fin; 8) caudal peduncle length/caudal peduncle depth; 9) head width/mouth width; 10) SL/distance between pelvic and pectoral fins; 11) SL/mouth width; 12) SL/distance between pelvic fin bases; 13) head width/distance between pelvic fin bases; 14) body width/distance between pelvic fin bases; 15) width of caudal peduncle/ depth of caudal peduncle; 16) SL/body depth; 17) body width/body depth.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
B. lancangjiangensis	6.4	6.8	1.1	7.7	3.0	4.2	4.2	2.4	3.4	5.7	22.9	13.4	2.0	2.1	1.3	6.5	1.0
B. kwangsiensis	5.7	6.4	0.9	5.9	3.0	4.1	4.1	2.3	3.7	4.7	23.5	11.6	1.8	2.0	1.2	6.0	1.1
B. longibarbata	5.6	6.0	1.1	6.7	3.2	4.7	3.6	3.0	3.8	5.1	22.8	10.9	1.8	2.0	1.4	6.0	1.1
B. brucei	4.9	5.5	1.3	7.2	4.0	4.4	4.3	3.3	3.2	3.4	17.6	9.1	1.6	1.8	1.4	8.4	1.7
B. burmanica	4.9	5.8	1.2	7.3	4.4	4.1	3.9	2.8	3.2	3.1	18.7	9.2	1.6	1.9	1.2	7.5	1.5
L. fimbriatus	7.6	7.5	1.1	8.6	2.0	6.4	5.0	22.9	3.7	5.9	27.9	17.0	2.3	2.3	3.5	8.1	1.1
L. dolichopterus	7.0	6.6	1.0	6.8	2.3	6.2	4.4	14.2	4.1	6.0	27.0	28.4	2.1	2.0	4.3	10.4	1.5
J. sinensis	4.4	5.8	1.3	7.8	2.8	2.9	3.0	5.7	2.1	8.3	12.2	22.5	3.9	5.1	2.9	6.2	1.4
J. abbreviata	5.4	5.6	1.3	7.3	2.9	2.8	3.3	3.3	2.2	7.6	12.4	13.1	2.3	2.4	2.1	7.1	1.3
H. elongatus	4.8	5.6	1.4	7.9	3.2	3.9	3.4	2.9	3.2	4.9	18.0	8.8	1.6	1.8	1.7	5.8	1.2
H. sp.	4.9	4.7	1.4	6.4	3.5	3.3	3.3	2.0	3.3	5.2	15.5	10.2	2.2	2.1	1.1	7.0	1.4
H. yaotanensis	5.0	5.1	1.3	6.5	3.2	4.0	3.5	1.7	3.4	5.3	17.1	15.0	3.1	3.0	1.0	6.3	1.3
H. megalopseos	4.3	4.7	1.4	6.6	3.2	4.4	3.5	2.4	3.9	4.8	18.4	10.9	2.3	2.5	1.4	6.1	1.4
H. nujiangensis	4.1	5.6	1.7	9.3	2.8	5.3	3.3	3.0	2.6	5.8	14.2	14.2	2.6	3.5	1.6	6.6	1.6
H. tchangi	4.2	5.0	1.8	8.8	2.6	4.2	3.3	2.9	2.0	7.5	10.0	16.5	3.3	3.9	1.1	7.5	1.8
H. pengi	3.7	4.1	1.8	7.6	3.5	4.0	2.9	2.2	3.2	6.9	13.2	27.1	6.6	7.3	1.3	6.5	1.7
H. macroptera	4.1	5.3	1.5	7.9	2.8	3.9	3.1	3.2	3.2	6.5	16.7	-	-	-	1.7	6.2	1.5
S. szechuanensis	3.7	4.3	1.7	7.3	3.7	4.4	2.9	1.6	3.0	6.8	12.8	-	-	-	1.0	7.4	2.0
S. sichangensis	3.4	4.1	2.1	8.4	3.5	4.7	2.8	1.5	3.1	7.0	12.8	-	-	-	1.5	5.7	1.7
S. wui	3.2	3.6	2.4	8.7	4.2	4.9	2.5	1.3	3.2	6.7	11.4	-	-	-	1.1	4.5	1.4
S. tonkinensis	3.4	3.6	2.1	7.5	4.7	4.8	3.0	1.3	2.5	7.9	8.9	-	-	-	3.2	5.2	1.5
M. omeiensis	3.1	3.3	2.8	9.3	4.1	4.6	2.6	1.0	3.2	7.7	10.8	-	-	-	1.2	4.5	1.5

Table 1 shows morphometric data for the various species. Table 2 lists meristic data and morphological characters. Explanations for codes and comments on characters are as follow:

Head shape (in dorsal view). — A, pointed head; B, rounded or squared head (immediately anterior to front of pectoral fins, sides run parallel to longitudinal axis); C, trapezoidal head.

Pectoral fin origins. — A, behind eye; B, under posterior margin of eye; C, under front margin of eye; D, under nares. In several species, pectoral rays are directed forwards and then backwards; the same coding is used to describe the anterior extent of pectoral rays.

Extent of pectoral and pelvic fins in relation to respectively pelvic fin base, and anus. — A, respectively do not reach pelvic fins, or anus; B, respectively reach pelvic fin base, and anus; C, respectively reach beyond pelvic fin base, and anus.

Shape of pelvic fins. — A, posterior margin concave; B, posterior margin straight; C, posterior margin convex or rounded; D, pelvic fins fused to each other along their posterior margin.

Maxillary barbels. — A, one barbel at each corner of mouth; B, one barbel and one elongated papilla at each corner of mouth; C, two barbels at each corner of mouth.

Shape of first pectoral ray. — A, not modified; B, much thickened proximally, forming an anterior projection; C, thickened and shortened.

TABLE 2

Meristic and morphological data of 22 species of *Balitora*-like fishes. Characters are as follow: 1) head shape; 2) origin of pectoral fin; 3) anterior extent of pectoral fins; 4) length of pectoral fins in relation to pelvic fins bases; 5) length of pelvic fins in relation with anus position; 6) simple pectoral rays; 7) branched pectoral rays; 8) simple pelvic rays; 9) branched pelvic rays; 10) lateral line scales; 11) shape of pelvic fins; 12) axillary pelvic lobe; 13) scales ornamentation; 14) tubercles on anal area; 15) maxillary barbels; 16) shape of first pectoral ray; 17) unculi on dorsal surface of 1st to 4th pectoral rays; 18) shape of simple anal rays; 19) respective positions of dorsal and pelvic fins origins.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
B. lancangjiangensis	A	A	A	A	A	8	10-12	2	8-9	64-68	A	+	C	B	A	A	-	A	S/1
B. kwangsiensis	A	A	A	A	A	7-8	10-12	2	8	61-68	A	+	C	B	B	A	-	A	S/1
B. longibarbata	A	A	A	A	A	8-10	11-14	2	8-10	74-76	A	+	B	A	C	A	-	B	S/1
B. brucei	A	A	B	A	A	9-11	10-12	2	8	65-70	B	+	D-E	A	A	B	-	A	S/1
B. burmanica	A	A	B	A	A	8-9	11-13	2	8	61-64	A	+	A	A	A	B	-	A	S/1
L. fimbriatus	A	A	A	A	A	7-9	10-12	3	8	85-96	A	+	A	A	C	A	-	A+B	1/1
L. dolichopterus	A	A	A	A	A	7-9	10-12	3-4	7-9	80-89	B	+	B	+	C	A	-	A+B	S/1
J. sinensis	B	B	C-D	C	B	13-14	11-13	3-5	13-15	78-81	B	+	-	-	A	B	-	A	S/4
J. abbreviata	B	B	C	C	A	11-12	11-12	3-4	10-12	75-76	B	+	-	-	B	B	-	A	S/2-3
H. elongatus	B	B	B-C	A	A-B	10-11	11-12	3-4	10-11	75-78	A	+	C	B	A	B	-	A	2/1
H. sp.	B	A	A	B	A-B	10	11	4	8	61	B	+	-	-	A	A	-	C	S/1
H. yaotanensis	B	A	A	A	A	8-10	11-13	4	8	69-72	?	?	-	-	?	?	?	?	S/1
H. megalopseos	B	A	B	B	A	10-11	11-12	3-4	10-11	75-78	C	+	E/-	-	C	A	+	A	S-1/1
H. nujiangensis	C	B	B-C	B	A	12	11	5	11-13	71-74	C	+	D	-	A	B	-	C	S-1/1
H. tchangi	C	C	D	C	A	10	14	4	15	71	C	+	-	-	A	B	-	A	S/7
H. pengi	C	B-C	C-D	C	A	12-13	11-13	5-6	13-15	58-63	C	+	B	B	A	B	+	A	S/2
H. macroptera	B	B	B-C	C	A	12	13-14	6-7	13-14	78-81	C	+	-	A	A	A	-	A	S/1
S. szechuanensis	C	B-C	D	B	C	11-12	12-14	5-7	15-17	56-62	D	+	-	-	B-C	B-C	-	C	S/1
S. sichangensis	C	B-C	C-D	C	A	10-12	12-14	6	13-15	70-74	D	+	-	-	B	B-C	-	E	S/4-5
S. wui	C	C	C-D	C	B	12-14	12-14	7-8	13-15	51-65	D	+/-	-	-	B	C	-	F	S/1
S. tonkinensis	C	C	D	C	C	13	14	9	14	47-53	D	+	C-D	B	B	C	-	D+B	S/2
M. omeiensis	C	D	D	C	A	10	10-13	5-8	12-13	70-75	D	+	-	-	B	C	-	A	S/5

TABLE 3

Character states of 29 characters of 22 species of homalopterines. x: apomorphic state. Characters: 1) elongated caudal peduncle, 2) large tubercles on anal fin rays, 3) anus displaced forwards, 4) more than two simple pelvic rays, 5) short head, 6) ten or more simple pectoral rays, 7) depressed body, 8) pectoral fins reach pelvic fins, 9) more than 8 branched pelvic rays, 10) pectoral fin origin under or in front of eye, 11) distance between posterior extremity of pelvic bases smaller, 12) pelvic fins close together, 13) contiguous pelvic fins, 14) fused pelvic fins, 15) more than 12 branched pectoral rays, 16) very short head, 17) pelvic fins rounded behind, 18) two barbels at each corner of mouth, 19) widened caudal peduncle, flattened back behind dorsal fin, 20) very long caudal fin, 21) pelvic fins reach anus,22) flat first simple anal ray, 23) less than 60 scales along lateral line, 24) more than 71 scales along lateral line, 25) thickened first pectoral ray, 26) dorsal fin origin behind vertical of first pelvic ray, 27) wide mouth, 28) large tubercules on first branched anal ray, 29) unculi on first three pectoral rays.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
B. lancangjiangensis																		x											
B. kwangsiensis			x						x									x						x				x	
B. longibarbata							x																		x				
B. brucei							x																		x				
B. burmanica							x																		x				
L. fimbriatus	x	x	x	x														x						x					
L. dolichopterus	x	x	x	x			x											x						x					
J. sinensis				x	x	x	x	x	x	x	x				x				x	x	x			x	x	x	x		
J. abbreviatus				x	x	x	x	x	x	x								x	x	x				x	x	x	x		
H. elongata				x	x	x	x		x															x	x				
H. sp.				x	x	x	x	x									x					x							
H. yaotanensis				x	x	x	x										x	x						x					
H. megalopseos				x	x	x	x	x	x								x	x						x	x				x
H. nujiangensis				x	x	x	x	x	x	x	x					x	x					x		x	x				
H. tchangi				x	x	x	x	x	x	x	x					x	x								x	x	x		
H. pengi				x	x	x	x	x	x	x	x	x			x	x	x						x		x	x			x
H. macroptera				x	x	x	x	x	x	x	x	x	x		x		x								/				
S. szechuanensis			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x		/	x	x		
S. sichangensis				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x								
S. wui				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x					x			
S. tonkinensis				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x		x			x		x	
M. omeiensis				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x						x					

Simple anal ray(s). — A, not modified; B, with large lateral tubercles; C, slightly flattened; D, two flat spines; E, only first simple ray flattened; F, a simple large anal spine.

Respective position of dorsal and pelvic fins origins is given as S/n (n being pelvic-ray number under base of first simple dorsal ray) if pelvic origin is anterior to dorsal origin or as n/1 (n being the branched dorsal fin-ray number dorsal to first pelvic ray) if dorsal-fin origin is anterior to pelvic-fin origin.

We tried to conduct a cladistic analysis of these characters. Table 3 shows the distribution of derived and primitive character states. These are derived from tables 1 and 2. Characters not taken into consideration are those we believed are labile (maxillary barbels [see below], scale ornamentation, tubercles in anal area). With these characters, we could only produce typical reticulate cladograms. The reticulate patterns might be due either to insufficient morphological data or incorrect polarity assignment of the characters. In this case, the pattern is certainly due in large part to the absence of other anatomical data which would probably resolve some of the polychotomies. Our impression is that there are numerous parallelisms (and possibly reversals) but we are unable to discuss them objectively at the moment. Some of these hypothesized parallelisms probably

also are the result of our use of external features only, which of course are subject to more environmental influence than are, for example, osteological characters. At this stage, we think that it is not worth discussing the numerous possible cladograms within the lineage. We discuss here only those lineages which appear well defined. We also discuss some characters which have usually been given a great weight in balitorine systematics and we mention some problems worth further investigations.

All species, except those placed in *Balitora,* form a lineage defined by more than two simple pelvic rays. This is considered a synapomorphy as all other species of Homalopterinae, all Nemacheilinae and all Cobitidae have a single simple pelvic ray. We could not find a synapomorphy linking the species of *Balitora.*

Lepturichthys is defined by the following autapomorphies: elongated caudal peduncle, presence of large tubercles on all anal fin rays, anus displaced forwards and all lip papillae much elongated. An elongated peduncle is also developped in *Jinshaia* and in some *Triplophysa* (Nemacheilinae) but never is it as long and slender as in *Lepturichthys.* The large tubercles on anal and the shape of lip papillae are unique in the suborder Cobitoidea. Anus position is unique in Homalopterinae and is only seldomly met in Nemacheilinae (the four species of *Aborichthys* Chaudhuri,1913 and *Nemacheilus baenzigeri* Kottelat, 1983).

The sister group of *Lepturichthys* includes all balitorines but *Balitora* and is defined by the following synapomorphies: shortened head and ten or more simple pectoral rays. A shortened head appears in some gastromyzontines while the greater number of simple pectoral rays is unique to the lineage.Other characters which may be interpreted as synapomorphies but are lacking (reversals?) in a few species are: pectoral fin reaching pelvic fin (lacking in *H. yaotanensis* and *H.* sp.) and more than 8 branched pelvic rays (lacking in *H. elongatus* and *H. yaotanensis).*

Jinshaia is defined by the following autapomorphies: widened caudal peduncle, flattened back behind dorsal fin and very long and deeply forked caudal fin. These characters are unique in Homalopterinae.

The sister-group of *Jinshaia* cannot be defined. Relationships of and among *Hemimyzon, Sinogastromyzon* and *Metahomaloptera* are unresolved and can certainly not be resolved without data on internal anatomy. An important problem to be solved by future researches is whether the fused pelvic fins evolved once or several times.

It has always been considered that the fused pelvic fins were a character diagnostic for *Sinogastromyzon* and *Metahomaloptera.* Recently described species show that the distinction between these two genera and *Hemimyzon* is not so clear and is becoming arbitrary: in two species of *Hemimyzon (H. nujiangensis* and *H. tchangi)* the space between pelvic fins is reduced (this also occurs in *Jinshaia sinensis);* two species *(H. taitungensis* and *H. pengi)* have contiguous pelvic fins and one *(H. macroptera)* even has pelvic fins fused together at the base of last pelvic rays. Considering these transition states it is doubtfull whether *Sinogastromyzon* can be retained or not. As we think that it not desirable to place them in synonymy without further (osteological) research on balitorine relationships, we decided to keep them separate.

Future research will also show if these transition states represent different level of specialization in a monophyletic lineage or are the results of parallelism. In connection with parallelism, it seems of interest to remind the disjunct distribution of *Sinogastromyzon* (Taiwan on the one hand and Jinsha-jiang, Xi-jiang and Red River on the other) and that one of the two *Hemimyzon (H. taitungensis)* occuring in Taiwan has adjacent base of last pelvic rays while *H. pengi* (similar pelvic fin condition) occurs in

Lancang-jiang and *H. macroptera* (pelvic fins fused together at the base) occurs in Nanpang-jiang. Besides, a pelvic disc evolved independently (at least) two more times in Homalopteridae (*Beaufortia* in south China and north Viet Nam, *Gastromyzon* and *Neogastromyzon* in Borneo).

For all morphometric characters we observed regular gradients from the highest to the lowest values. These are usually related to an evolutionary and morphological shift from quite slender, deep bodied, long-headed *Balitora* to the contracted, wide bodied and short-headed *Metahomaloptera.* Gradients are recognizable in the following ratios: standard length/body width, head width/head length, standard length/head length, standard length/length of pectoral fins, standard length/ distance between pelvic bases, etc. However there are several instances where some species seem specialized for one character while they are primitive for others. For example, *H. macroptera* has pelvics fused at the base (specialized) but retains a long head, a long postanal body length, a slender caudal peduncle, a small mouth, and dorsal origin over first pelvic ray (all supposedly primitive). Also *H. tchangi* has a very short head and the widest mouth (specialized) but retains a long caudal peduncle (primitive). Similarly, *S. szechuanensis* has a pelvic disc (specialized) but retains a long and slender caudal peduncle and its dorsal fin origin is above the pelvic fin origin (primitive). Finally, the very specialized *S. wui* has a specialized pelvic disc, large eyes and a large anal spine (both autapomorphies) but retains a dorsal-fin origin above the pelvic-fin origin (primitive).

The number of maxillary barbels has traditionally (and uncritically) been used to distinguish genera but it proved of limited use. We observed that the number of maxillary barbels shows great intra- and interspecific variation. In a few species (*H. megalopseos, B. longibarbata*) there really are two true barbels at each corner of mouth, but in all other species we examined the second "barbel" is clearly only a papilla similar to the ones on the lips or slightly more elongated. The papilla which originates on the lip is clearly distinct from the barbel, which originates from under the lip. In some cases, we observed great variation between the two corners of the mouth in a single specimen (*H. macroptera*). In some species which are usually described as having two barbels (*J. sinensis, J. abbreviata*) we were unable to observe a second "barbel" in most of the examined specimens. In *Lepturichthys,* all lip papillae are much elongated and barbel like.

Our conclusions differ somewhat from the phylogeny proposed by CHEN (1980b). CHEN's cladogram shows *Sinogastromyzon* as the sister-genus of *Metahomaloptera,* both forming the sister-group of *Hemimyzon; Sinohomaloptera* is the sister-genus of *Lepturichthys,* this lineage being the sister-group of the *Sinogastromyzon-Metahomaloptera-Hemimyzon* one. The synapomorphies used to construct this cladogram are not listed, so that we cannot discuss CHEN's conclusions. CHEN placed *Balitora* as the sister-genus of *Balitoropsis,* this group forming the sister-group of *Homaloptera-Bhavania-Travancoria.* CHEN's *Balitora* and *Sinohomaloptera* are showed here to be congeneric (*Balitora*). *Balitoropsis bartschi* Smith,1945 (type species of *Balitoropsis* Smith, 1945) is considered to be a member of *Homaloptera* (KOTTELAT, unpubl.) and the description and illustration of *Balitoropsis yunnanensis* Chen, 1978 also indicates that it belongs to *Homaloptera.* CHEN's confusion concerning *Balitora, Balitoropsis* and *Homaloptera* is no doubt due to unfamiliarity with non-Chinese species. With these minor corrections in mind, we agree with CHEN in dividing Homalopterinae into two lineages, Homalopterini (whose monophyly still has to be demonstrated) and Sinogastromyzontini (characterized by the following synapomorphies: arched mouth with both jaws covered by a horny sheath; rostral flap fivided into three lobes, the median one usually the largest, between rostral

barbels; both lips with one or two rows of papillae; lower lip not interrupted; one or two maxillary barbels at the corner of mouth).

SAWADA (1982) also attempted to investigate relationships in Homalopterinae, but he had only two of the species of interest here (*S. puliensis* and *H. formosanus*) and reached no clear conclusions. These problems are not addressed to by HORA (1931, 1932) and SILAS (1954) who also discussed homalopterine systematics but at a time when most of the species mentioned here were unknown.

PHYLOGENY AND CLASSIFICATION

It is usually postulated that classification must reflect phylogeny as closely as possible. Without discussing the cogency of this *credo,* it obviously would serve no purpose to use a classification as tentative and unconclusive as the rough outline of a phylogeny discussed above. Awaiting new insights into this problem, we feel better to use a somewhat conservative classification, the introduction of too many new generic names with potentially short life expectencies being not a progress. Thus the classification we propose has to rely mainly in organization levels; we are aware that it will probably satisfy none of the presently active parties in systematics philosophy.

SYSTEMATIC SECTION

Artificial key to the Chinese balitorine genera

1. — Two simple pelvic rays ..... *Balitora*
   Three or more simple pelvic rays 2
2. — Length of caudal peduncle more than 10 times its depth; all lip papillae barbel-shaped, numbering up to 50. ..... *Lepturichthys*
   — Length of caudal peduncle less than 6 times its depth; at most one or two papillae at the corner of mouth barbel-shaped 3
3. — Pelvic fins not forming a sucking disc; if posteriorly fused, fused only at the base, membranes not fused (in *H. macroptera*) 4
   — Pelvic fins posteriorly fused to form a sucking disc with continuous membrane 5
4. — Caudal fin deeply forked, its length less than 3 times in standard length, lobes more than 2.5 times length of median rays (at least in adults); caudal peduncle with a rounded or squared section; width of body at origin of anal fin about 2-3 times least depth of caudal peduncle ..... *Jinshaia*
   — Caudal emarginated to slightly forked, never deeply forked, lobes not more than 1.5 times length of median rays; length of caudal fin more than 3.5 times in standard length; caudal peduncle laterally compressed; width of body at origin of anal fin 1.0-1.7 times least depth of caudal peduncle ..... *Hemimyzon*
5. — Gill openings restricted to dorsal side of body ..... *Metahomaloptera*
   — Gill openings extending to ventral side of body in front of pectoral fins ..... *Sinogastromyzon*

Balitora Gray

Balitora Gray,1830:pl.88 (original indication; type species: *Balitora brucei* Gray, 1830, by subsequent designation of JORDAN 1919:178). Gender: feminine.

Sinohomaloptera Fang,1930a:26 (original description as a subgenus of *Homaloptera;* type species: *Homaloptera kwangsiensis* Fang, 1930, by original designation). Gender: feminine. **New synonym.**

Balitora as understood here includes a number of species whose monophyly cannot be demonstrated at present. However, as the differences between the various components are very slight, grouping them in a single genus seems the more convenient way to deal with them. The only character which would distinguish *Balitora* from *Sinohomaloptera* is the number of barbels at the corner of mouth, a character of little use as shown above. In addition in all species (but *B. longibarbata*) the second barbels is better described as a slightly elongated papilla. Thus we think that *Sinohomaloptera* cannot be conserved.

The Indian and Indochinese species being reviewed by KOTTELAT (in press), we present here only some data about Chinese species. A key to all known species is also given by KOTTELAT (in press).

Balitora lancangjiangensis (Zheng)

Balitora brucei (non Gray, 1830) Chen, 1978:335, figs. 3-4. - Li, 1976: 118.

Sinohomaloptera lancangjiangensis Zheng, 1980: 110, figs. 1-2.

Distribution. — Known only from Lancang-jiang in Xishuangbanna, Yunnan, China and Red River in Yunnan and Viet Nam.

Remark. — Contrary to data in ZHENG's original description, our topotypical material has a completely scaled belly between pelvic fins bases and anus. Our material from Red River has no scales on the belly in front of anus. As we are unable to find any other significant differences between these two populations, we consider them as conspecific.

Balitora kwangsiensis (Fang)

Homaloptera (Sinohomaloptera) kwangsiensis Fang, 1930a: 27, pl. 1, figs. 1-2.

Sinohomaloptera kwangiensis Fang, 1930b: 26. — Chen, 1978: 336.

Sinohomaloptera hoffmanni Herre, 1938: 429, fig. 1.

? *Homaloptera (Balitora) brucei:* Yen, 1978: 205, fig. 93.
? *Balitora heteroura* Pan, Liu & Zheng, 1983: 105, fig. 1.

Distribution. — Red River and Nanpan-jiang in Yunnan, Guanxi and Guangdong provinces of China.

Remarks. — We have not seen the holotype (and only known specimen) of *B. heteroura*, but from the very brief and not detailed original description, it looks very like our material of *B. kwangsiensis*. The only apparent difference is a greater number of

lateral line scales (75, vs 61-66). A definitive conclusion can be reached only after examination of the holotype and additional material from the type locality.

This species occurs sympatrically with *B. lancangjiangensis* in the Red River drainage in Pingbian Co. (22°58'N 103°40'E). The species described and illustrated by YEN (1978) as *Homaloptera (B.) brucei* is certainly one of them. *Balitora kwangsiensis* being characterized by short pectoral fins (reaching only slightly beyond midway to pelvic fin base, vs nearly reaching pelvics), dorsal origin slightly in front of pelvic fin origin (vs. above), it seems that YEN's material can be identified as *B. kawngsiensis*. An other and more obvious character, not to be seen on YEN's figure, would be the presence of scales between anus and the posterior extremity of pelvic fins base (vs absence).

Balitora longibarbata (Chen)

Sinohomaloptera longibarbata Chen, in ZHENG, CHEN & HUANG, 1982: 394, fig. 1.

Distribution. — Nanpan-jiang basin in Yunnan, China.

Lepturichthys Regan

Lepturichthys Regan 1911:31 (type species: *Homaloptera fimbriata* Günther, 1888, by original description). Gender: masculine.

KEY TO THE SPECIES OF *Lepturichthys*

1. — Distance between anus and anal fin 3.8-4.6 times in distance from pelvic fins origin and anal fin; vertebrae 4+31-32 ..... *L. dolichopterus*
   — Distance between anus and anal fin 3.0-3.3 times in distance from pelvic fins origin and anal fin; vertebrae 4+35-37 ..... *L. fimbriatus*

Lepturichthys fimbriatus (Günther)

Homaloptera fimbriata Günther, 1888: 433; 1892: 298, pl. 3, fig. A.

Lepturichthys fimbriata: Chen, 1978: 337. — Ichthyological Laboratory, Hubei Province Institute of Hydrobiology, 1976: 155.

Lepturichthys güntheri Hora, 1932: 295, pl. 10, fig. 7. — Ichthyological Laboratory, Hubei Province Institute of Hydrobiology, 1976: 154.

Lepturichthys nicholsi Hora, 1932: 297, pl. 10, fig. 8, pl. 12, fig. 3. — Ichthyological Laboratory, Hubei Province Institute of Hydrobiology, 1976: 154, fig. 120.

Distribution. — Upper and middle drainage of Chang-jiang, China.

Remarks. — See CHEN (1980:338), HORA (1932) and SILAS (1954) for complete synonymy. HORA's original spelling of *L. güntheri* has to be emended as *L. guentheri* (INTERNATIONAL CODE OF ZOOLOGICAL NOMENCLATURE, art 32(d)(i)(1)).

Lepturichthys dolichopterus Dai

Lepturichthys dolichopterus Dai, 1985: 221, figs. 1-2.

Distribution. — Upper Min River in Fujian Prov., China.

Jinshaia, new genus

Type species: *Psilorhynchus sinensis* Sauvage & Dabry de Thiersant, 1874: 14. Gender: feminine.

Diagnosis. — The new genus is distinguished by the following characters: caudal peduncle with a rounded or squared section; back, behind dorsal fin, flat; width of body at origin of anal fin 2-3 times greater than least depth of caudal peduncle; caudal fin long, its length less than three times in SL, deeply forked, lobes more than 2.5 times longer than median rays (at least in adults); 11-14 simple and 12-15 branched pectoral rays; 3-5 simple and 10-15 branched pelvic rays.

Discussion. — Comparison and relationships of the new genus are given in the above key and general discussion of Homalopterini interrelationships. The new genus has only been reported from the mainstream of the upper Jinsha-jiang and its major tributaries in Sichuan and Yunnan provinces. Its greatly elongated caudal fin, flattened and widened long caudal peduncle allowed him to inhabit high gradient mainstreams where it supposedly is a good swimmer; this bauplan is somewhat similar to the related *Lepturichthys*. Other Balitorini are poor swimmers.

Etymology. — Named for the Jinsha-jiang (or Yangtze-kiang in former transcriptions), the longest river of China and only known distribution of the genus.

Key to the Species of *Jinshaia*

1. — Distance between last branched rays of pelvic fins 4.5-5.6 times in body width; V 3-5/13-15; dorsal fin origin over 4th ray of pelvic fins .... *J. sinensis*

   — Distance between last branched rays of pelvic fins 2.5-3.1 times in body width; V 3-4/10-12; dorsal fin origin over 2nd-3rd pelvic ray .... *J. abbreviata*

Jinshaia sinensis (Sauvage & Dabry de Thiersant) (Fig. 1)

Psilorhynchus sinensis Sauvage & Dabry de Thiersant, 1874: 14.

Hemimyzon sinensis: Chen, 1978: 341. — Ichthyological Laboratory, Hubei Province Institute of Hydrobiology, 1976: 156, fig. 122.

Distribution. — Jinsha-jiang and upper Chang-jiang drainages, China.

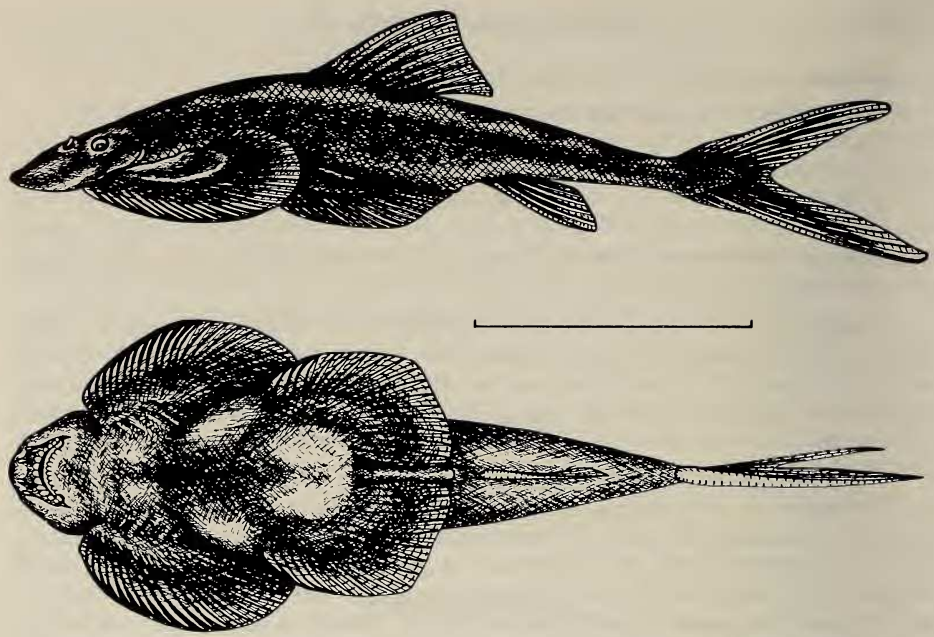

FIGURE 1

Jinshaia sinensis, Yunnan: He Qiang Co., KIZ 771023, 72 mm SL. Scale bar: 30 mm

Jinshaia abbreviata (Günther)

Homaloptera abbreviata Günther, 1892: 248.

Hemimyzon abbreviata; Chen, 1978: 341. — Ichthyological Laboratory, Hubei Province Institute of Hydrobiology, 1976: 155, fig. 121

Distribution. — Jinsha-jiang and upper Chang-jiang drainages, China.

Hemimyzon Regan

Hemimyzon Regan, 1911: 32 (type species: *Homaloptera formosana* Boulenger, 1894 by original designation). Gender: masculine.

KEY TO THE SPECIES OF *Hemimyzon*

1. — Pelvic fins contiguous 2
   — Pelvic fins not contiguous 3
2. — 13-14 branched pelvic rays; Nanpan-jiang in Yunnan ..... *H. macroptera*
   — 10-12 branched pelvic rays; East coast of Taiwan ..... *H. taitungensis*

3. — Distance between last rays of pelvic fins about 7 times in body width at origin of pelvic fins ..... *H. pengi*
— Distance between last rays of pelvic fins 1.5-4.0 times in body width at origin of pelvic fins 4
4. — Dorsal fin origin above base of 4th-7th pelvic ray 5
— Dorsal fin origin above base of first pelvic ray or slightly in front 6
5. — Mouth width about twice in head width; 15 branched pelvic rays ..... *H. tchangi*
— Mouth width about three times in head width; 9-10 branched pelvic rays ..... *H. formosanus*
6. — 8 branched pelvic rays 7
— 10-13 branched pelvic rays 8
7. — Distance between last branched pelvic rays about 15 times in SL ..... *H. yaotanensis*
— Distance between last branched pelvic rays about 10 times in SL ..... *H.* sp.
8. — Two true barbels at each corner of mouth; head width about 4.7 times in SL ..... *H. megalopseos*
— A single barbel at each corner of mouth; head width about 3.5 times in SL 9
9. — Distance between last branched pelvic rays about 1.8 times in body width and 9 times in SL; pectoral fins do not reach pelvic fins ..... *H. elongata*
— Distance between last branched pelvic rays about 3.5 times in body width and 14 times in SL; pectoral fins reach pelvic fin origin ..... *H. nujiangensis*

Hemimyzon elongatus (Li & Chen)

Balitora elongata Li & Chen, 1985: 169, fig. 1.

Distribution. — Only known from the Lancang-jiang basin in Yunnan, China.

Hemimyzon formosanus (Boulenger)

Homaloptera formosana Boulenger, 1894: 463.

Hemimyzon formosanum: Tzeng & Shen, 1982: 165, fig. 4.

Hemimyzon formosanus: Watanabe, 1983: 117, figs. 11-13.

Distribution. — Taiwan.

Hemimyzon macroptera Zheng

Hemimyzon macroptera Zheng, in ZHENG, CHEN & HUANG, 1982: 339, fig. 5.

Distribution. — Nanpan-jiang basin in Yunnan, China

Hemimyzon megalopseos Li & Chen 1985

Hemimyzon megalopseos Li & Chen, 1985: 170, fig. 2.

Distribution. — Nanpan-jiang basin in Yunnan, China

Hemimyzon nujiangensis (Zheng & Zhang)

Balitora nujiangensis Zheng & Zhang, 1983: 66, fig. 1.

Distribution. — Nu-jiang basin in Yunnan, China.

Hemimyzon pengi (Huang)

Balitora pengi Huang, in ZHENG, CHENG & HUANG, 1982: 395, fig. 2.

Distribution. — Lancang-jiang system in Xishuangbanna, Yunnan, China.

Hemimyzon taitungensis Tzeng & Shen

Hemimyzon taitungensis Tzeng & Shen, 1982: 166, figs. 5-6. — Watanabe, 1983: 118, figs. 14-16.

Distribution. — Taiwan.

Hemimyzon tchangi (Zheng)

Pseudogastromyzon sinensis (non Sauvage & Dabry de Thiersant, 1874) Zhang, 1959: 127.

Balitora tchangi Zheng, in ZHENG, CHEN & HUANG, 1982: 396, fig. 3.

Distribution. — Lancang-jiang system in Xishuangbanna, Yunnan, China.

Hemimyzon yaotanensis (Fang)

Sinohomaloptera yaotanensis Fang, 1931a: 137, fig. 1.

Sinohomaloptera yaotanensis acuticauda Fang, 1931a: 143, fig. 5.

Hemimyzon yaotanensis: Ichthyological Laboratory, Hubei Province Institute of Hydrobiology, 1976: 156, fig. 123.

Distribution. — Jinsha-jiang basin in Sichuan, China.

Metahomaloptera Chang

Metahomaloptera Chang, 1944: 54 (type species *M. omeiensis* Chang, 1944, by original designation). Gender: feminine.

Metahomaloptera omeiensis Chang
(Fig. 2)

Metahomaloptera omeiensis Chang, 1944: 54.

Distribution. — Jinsha-jiang basin in Sichuan Prov., China.

Remark. — As this species has never been illustrated, we think it useful to provide here an illustration.

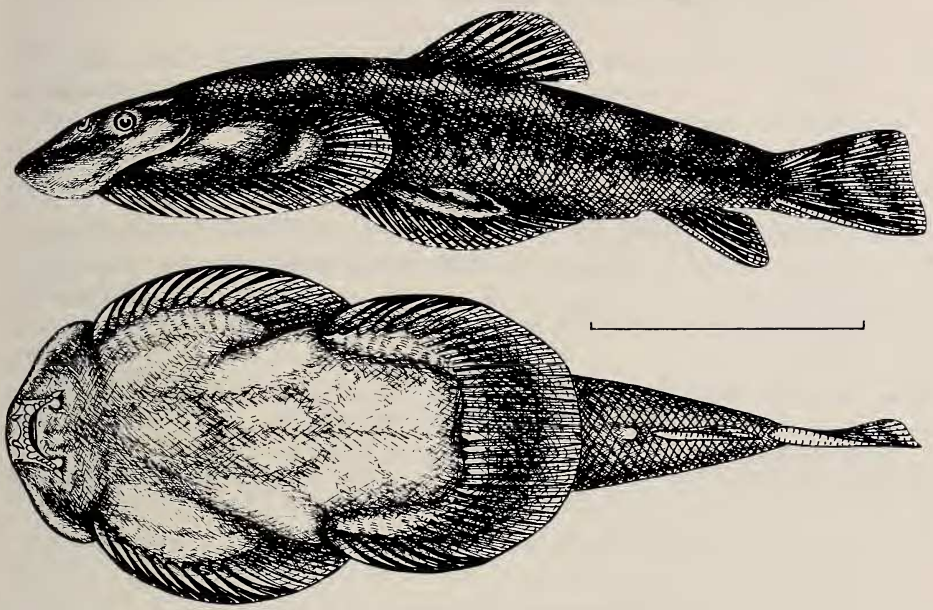

FIGURE 2

Metahomaloptera omeiensis, Sichuan: Ya'an Co., KIZ 795676, 54.0 mm SL. Scale bar: 20 mm.

Sinogastromyzon Fang

Sinogastromyzon Fang 1930a:35 (type species: *S. wui* Fang 1930, by original designation). Gender: masculine.

Remark. — The description of *S. nanpanjiangensis* Li, 1987, from Nanpan-jiang basin in Yunnan, appeared after completion of this revision and could not be included.

KEY TO THE SPECIES OF *Sinogastromyzon*

1. — 15-16 simple pectoral rays; 11 simple pelvic rays 2
   — 11-14 simple pectoral rays; 5-8 simple pelvic rays 3
2. — 45-50 scales along lateral line ..... *S. minutus*

— 63 scales along lateral line ..... *S. chapaensis*

3. — 38-44 scales along lateral line ..... *S. rugocauda*

— 47-72 scales along lateral line 4

4. — Anal fin with a stout spine; pelvic fin base without conspicuous axillary lobe; sides of body scaled between bases of pectoral and pelvic fins .... *S. wui*

— No spine or only slender weak flat spine on anal fin; pelvic fin base with conspicuous axillary lobe; sides of body naked between bases of pectoral and pelvic fins 5

5. — Pelvic fins do not reach anus which is close to anal fin; 70-75 lateral line scales ..... *S. sichangensis*

— Pelvic fins reach anus which is about midway between base of pelvic fins and anal fin; 47-62 scales along lateral line 6

6. — Anal fin with 2 simple rays and no spine 7

— Anal fin with a single weak slender spine and no additional simple ray 8

7. — Head length 4.2-5.1 times in SL; length of caudal peduncle 1.6-2.1 times in HL ..... *S. szechuanensis*

— Head length 3.5-4.0 times in SL; length of caudal peduncle 2.3-2.5 times in HL ..... *S. hsiashiensis*

8. — 11/14-15 pectoral rays; 6/17 pelvic rays; 60 lateral line scales .... *S. puliensis*

— 13/14 pectoral rays; 9/14 pelvic rays; 47-53 lateral line scales .... *S. tonkinensis*

Sinogastromyzon chapaensis Yen

Sinogastromyzon chapaensis Yen, 1978: 220, fig. 102.

Distribution. — Red River system in Viet Nam (Sapa).

Sinogastromyzon hsiashiensis Fang

Sinogastromyzon hsiashiensis Fang, 1931b: 48, fig. 3.

Distribution. — Yun-jiang system in Hunan Prov., China.

Sinogastromyzon minutus Yen

Sinogastromyzon minutum Yen, 1978: 222, fig. 104.

Remark. — *Sinogastromyzon* being masculine, the specific epithet has to be emended as *minutus*.

Distribution. — Red River system in Viet Nam (Lai Chau).

Sinogastromyzon puliensis Liang

Sinogastromyzon puliensis Liang, 1974: 153. — Chen, 1978: 343, figs. 7-8. — Tzeng & Shen, 1982: 164, fig. 3. — Watanabe, 1983: 114, figs. 8-10.

Sinogastromyzon rugocauda Yen

Sinogastromyzon rugocauda Yen, 1978: 221, fig. 103.

Distribution. — Red River system in Viet Nam (Son La).

Sinogastromyzon sichangensis Chang

Sinogastromyzon sichangensis Chang, 1944: 53. — Ichthyological Laboratory, Hubei Province Institute of Hydrobiology, 1976: 153, fig. 119.

Distribution. — Jinsha-jiang and upper Chang-jiang in Sichuan and Hubei provinces, China.

Sinogastromyzon szechuanensis Fang

Sinogastromyzon szechuanensis Fang, 1930c: 99. — Ichthyological Laboratory, Hubei Province Institute of Hydrobiology, 1976: 152, fig. 118.

Distribution. — Jinsha-jiang basin in Sichuan Prov., China.

Sinogastromyzon tonkinensis Pellegrin & Chevey

Sinogastromyzon tonkinensis Pellegrin & Chevey, 1935: 232, fig. 1. — Chevey & Lemasson, 1937: 97, pl. 29, fig. 65.

Distribution. — Red River system in Yunnan Prov., China and Viet Nam.

Sinogastromyzon wui Fang

Sinogastromyzon wui Fang, 1930a: 36, pl. 2, figs. 3-4.

Sinogastromyzon intermedius Fang, 1931b: 54, fig. 7.

Sinogastromyzon sanhoensis Fang, 1931b: 56, fig. 9.

Distribution. — Nanpan-jiang and Xi-jiang basins in Guangdong and Guanxi provinces, China.

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APPENDIX

Material examined

Unless otherwise stated, all material is from China, Yunnan Province.

Balitora brucei and *Balitora burmanica:* see list of material in KOTTELAT (in press).

Balitora kwangsiensis: KIZ 776603-604, 2 ex., 80.8-89.9 mm SL; Nanpan-jiang basin: Kuang Nan Co. (24°05'N 105°05'E). — KIZ 8311223, 1 ex., 50.7 mm SL; Red River basin: Nan Jian Co. 25°05'N 100°30'E). — 8540282-0284, 3 ex., 41.2-66.9 mm SL; Red River basin: Ping Bian Co. (22°58'N 103°40'E).

Balitora lancangjiangensis: KIZ 737226-229, 4 ex., 63.5-74.5 mm SL; Lancang-jiang basin: Jing Dong Co. (24°30'N 100°50'E). — KIZ 737020, 737023-024, 737026-038, 737040-045, 20 ex., 58-73 mm SL; Lancang-jiang basin: Meng Hai Co. (21°58'N 100°27'E). — KIZ 846798, 1 ex., 71.0 mm SL; Red River basin: Ping Bian Co. (22°58'N 103°40'E).

Balitora longibarbata: KIZ 774170-173, 774175-179, 774181, 10 ex., syntypes, 54.3-76.7 mm SL; Nanpan-jiang basin: Yilian Co. (24°50'N 103°10'E). — KIZ 774182-184, 774203, 774209, 6 ex., 45.5-56.3 mm SL; same data.

Hemimyzon elongatus: all in Lancang-jiang basin: KIZ 819072, holotype, 62.2 mm SL; Yangbi Co. (25°40'N 99°56'E). — KIZ 748791, 839074, 2 ex., 62.9-64.8 mm SL; same data. — KIZ 866001, 1 ex., 70 mm SL; same data. — KIZ 745049-050, 2 ex., 62.3-69.0 mm SL; Xisuangbanna: Muang Tchuan Co. (21°30'N 101°35'E). - KIZ 831145, 1 ex., 33.6 mm SL; Yun Xian Co. (24°30'N 100°10'E).

Hemimyzon macroptera: KIZ 774233, 774288, 774254, 3 ex., 48.2-69.7 mm SL; Nanpan-jiang basin: Luo Ping Co. (24°50'N 114°20'E). — KIZ 775906-911, 775913, 775915-916, 775918-934, 26 ex., 49.6-77.6 mm SL; Jinsha-jiang basin: Yiliang Co. (24°50'N 103°30'E). — KIZ 774210-305, 95 ex., 41.0-69.2 mm SL; same data. — KIZ uncat., 8 ex., 52.2-64.0 mm SL; no data.

Hemimyzon megalopseos: KIZ 774193, holotype, 62.0 mm SL; Nanpan-jiang basin: Yiliang Co. (24°50'N 103°30'E). — KIZ 774188, 774196-198, 774201-202, 774204-205, 774207, 9 ex., paratypes, 59.7- 66.6 mm SL; same data. — KIZ 774183, 774189-192, 774194-195, 774199-200, 9 ex., 38.5-52.0 mm SL; same data.

Hemimyzon nujiangensis: KIZ 8110132, 8110134-135, 3 ex., 76.9-81.0 mm SL; Nu-jiang basin: Lu Shui Co. (22°40'N 98°50'E).

Hemimyzon pengi: all in Lancang-jiang basin in Xishuangbanna: KIZ 737047-53, 7 ex., syntypes, 34.3-38.5 mm SL; Menghai Co. (22°N 100°30'E). — KIZ 736090-91, 745113, 3 ex., 51.7-56.8 mm SL; Muang Tchuang Co. (21°30'N 101°35'E).

Hemimyzon tchangi: KIZ 748743-52, 748754, 11 ex., 58.9-77.6 mm SL; Lancang-jiang basin: Weichi Co. (27°10'N 99°30'E). — KIZ 839262, no data.

Jinshaia abbreviata: KIZ 82101072-82, 11 ex., 40.9-58.8 mm SL; Jinsha-jiang basin: Yianjing Co. (28°N 104°20'E).

Jinshaia sinensis: all in Jinsha-jiang basin: KIZ 82110065, 1 ex., 66.0 mm SL; Swui Tjang Co. (28°40'N 104°E). — KIZ uncat., 2 ex., 105.7-113.4 mm SL; Dukou Co. (26°30'N 101°50'E). — KIZ 70007-13, 7 ex., 80.0-99.6 mm SL; Dukou Co. (26°30'N 105°50'E). — KIZ 771020, 22-23, 3 ex., 52.5-75.0 mm SL; Yunnan: He Qiang Co. (26°18'N 100°22'E).

Lepturichthys dolichopterus: KIZ 80321, 80368, 2 ex., 83-104 mm SL; Fujian Prov.: Upper Min-jiang in Shun Chang Co. (26°50'N 117°48'E).

Lepturichthys fimbriatus: all in Jinsha-jiang basin: KIZ 70001-06, 6 ex., 95-150 mm SL; Dukou Co. (26°30'N 105°50'E). — KIZ 753022-023, 2 ex., 110-147 mm SL; Le Shan Co. (29°40'N 103°40'E).

Metahomaloptera omeiensis: KIZ 795676, 1 ex., 54.0 mm SL; Sichuan: Jinsha-jiang basin: Ya'an Co. (30°N 102°30'E).

Sinogastromyzon sichangensis: KIZ 82100931-0945, 15 ex., 35-57 mm SL; Jinsha-jiang basin: Wei Xin Co. (27°52'N 105°03'E).

Sinogastromyzon szechuanensis: KIZ 811121, 1 ex., 60 mm SL; Jinsha-jiang basin: Le Shan Co. (29°40'N 103°40'E).

Sinogastromyzon tonkinensis: all in Red River basin: KIZ 737149-155, 7 ex., 45-50 mm SL; Jing Dong Co. (24°30'N 100°50'E). — KIZ 60024, 60026, He Kou Co. (22°33'N 103°58'E).

Sinogastromyzon wui: KIZ 776605-614, 15 ex., 47-68 mm SL; Nanpan-jiang basin: Kuang Nan Co. (24°05'N 105°05'E).

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